PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
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ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 03 July 2000 (03.07.00)	
International application No. PCT/SE99/02117	**Applicant's or agent's file reference** RF 99695
International filing date (day/month/year) 18 November 1999 (18.11.99)	**Priority date** (day/month/year) 19 November 1998 (19.11.98)
Applicant DA SILVA, Nino	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

26 May 2000 (26.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference RF 99695	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE99/02117	International filing date *(day month year)* 18.11.1999	Priority date *(day month year)* 19.11.1998
International Patent Classification (IPC) or national classification and IPC7 H04N 7/18		
Applicant AO:s Metall & Mek.Verkstad AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
26.05.2000	19.03.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Erik Veillas /OGU Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/02117

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-13 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☒ the claims:
pages _____ , as originally filed
pages _____ , as amended (together with any statement) under article 19
pages _____ , filed with the demand
pages 16-17 , filed with the letter of 08.01.2001

☒ the drawings:
pages 1 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

☐ the sequence listing part of the description:
pages _____ , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language English which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☒ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/02117

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-11	YES
	Claims		NO
Inventive step (IS)	Claims	1-11	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-11	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The claimed invention concerns digitalization and archiving of medical films. The method of the claimed invention is performed using a digital camera attached to a positioning system and connected to a digital electronic archive for medical information. This method allows for selective and partial magnification of medical films with found pathologically interesting parts, digitalization, and for transfer and storing of the obtained digital electronic images. One objective of the invention is to increase the transfer speed and to reduce the storage space for such images. This objective is accomplished without loosing important details of the medical films thanks to selective partial magnification.

The International Search Report revealed the following documents:

D1: DE 4203447
D2: US 5633674
D3: EP 0838767

Amended claims 1-11 have been filed with the letter dated 8th January 2001. The amended claims 1-11feature that the method comprises a step of selectively and partially magnifying found pathologically interesting parts, a step of selectively exposing these parts and a step of transferring and storing the obtained digital images. None of D1-D3 discloses such features. Previous claims concerning an apparatus dedicated to apply the method have been cancelled.

D1 discloses a method and an apparatus achieving digitalization of analogue X-ray images by means of a CCD imager (see abstract, col. 3 line 52-57). It is specifically indicated that the obtained picture may be distributed

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Box V.

electronically or archived (se col. 3 line 43-47, col. 8 line 53-56, col. 5 line 19-21). The digitalization process includes a noise reduction step, where a CCD-display having four times as many pixels as usual may be used (see col. 4 line 21-54). However, the system and method of D1 fail to allow performing a selective partial magnification or exposure of pathologically interesting parts. Rather, magnification may be performed after digitalization thanks to post-processing in D1.

D2 discloses a system comprising a camera mounted on a manually controlled unit. This camera comprises focus and zoom functions, which provide for selective and partial magnification. This system is however not devoted to digitalization, transfer, and storage of medical films and there is no provision for selective exposure, transfer or storage. The advantages of saving storage place and transfer speed in the particular field of medical fields are not brought about by D2.

With respect to the arguments given above, the invention according to claims 1-11 is new (N), has industrial applicability (IA), and is considered to involve an inventive step (IS).

CLAIMS

1. A method for transfer of medical films, particularly X-ray films, or parts thereof, for diagnostics to digital electronic form and for archiving of these digital electronic images, **characterized in** that said method is performed by using a digital camera (11) attached to a positioning system (15), and a screen (25), said digital camera being connected to said screen and to a digital electronic image archive, whereby

- medical films arranged on a light surface are selectively examined on said screen or in a finder of said camera in order to find pathologically interesting parts;

- medical films, or parts thereof, with pathologically interesting parts found are selectively and partially magnified;

- medical films, or parts thereof, with pathologically interesting parts found and magnified, are selectively exposed; and

- digital electronic medical images obtained in the step of exposing are transferred to and stored in said digital electronic image archive.

2. The method as claimed in claim 1 wherein said medical films, being X-ray films, are arranged in a light cabinet (21) and said digital camera (11), attached to said positioning system (15), is arranged in front of said light cabinet prior to the step of examining.

3. The method as claimed in claim 1 wherein said method for transfer is performed in connection with prediagnostics.

4. The method as claimed in claim 1 wherein said method for transfer is performed in connection with diagnostics

or consultation, particularly during an X-ray round.

5. The method as claimed in any of claims 1 to 4 wherein patient-related data is input and stored together with the obtained digital, electronic, medical images in the digital, electronic image archive.

6. The method as claimed in claim 5 wherein the digital, electronic image archive is comprised of a PACS (Picture Archive Communications System) and the data storage is performed by communication with a patient information system RIS (Radiological Information System) included in the PACS.

7. The method as claimed in any of claims 1 to 6 wherein the presence of introduced motion unsharpness before and during said selective exposure is measured.

8. The method as claimed in claim 7 wherein the motion unsharpness is determined in dependence on the detection of temporal intensity variations in a single image element.

9. The method as claimed in claim 7 wherein the motion unsharpness is determined in dependence on the detection of temporal image position variations for a predetermined detail on a medical film.

10. The method as claimed in any of claims 1 to 9 wherein the light intensity of the light surface is regulated in dependence on the dynamic range of a particular medical film.

11. The method as claimed in any of claims 1 to 9 wherein a diaphragm is arranged in front of the camera in dependence on the dynamic range of a particular medical film.

4. The system as claimed in any of claims 1 to 3, wherein it is, simultaneously with said transfer, arranged for use for diagnostics and consultation, particularly during an X-ray round.

5. The system as claimed in any of claims 1 to 4, wherein it is connected to a system for digital image archiving and communication of the PACS (Picture Archive Communications System) kind in such a way that said transfer comprises transferring the obtained digital, electronic images to and storing them in said system for digital image archiving and communication of the PACS kind.

6. The system as claimed in any of claims 1 to 5, wherein the digital camera (11) comprises a CCD chip and is provided with a zoom object (13).

7. The system as claimed in any of claims 1 to 6, wherein the positioning system (15) comprises a vertical pole (15a) and a coordinate slider (15b) and the digital camera is arranged to be movable, particularly by a motor, vertically and horizontally.

8. The system as claimed in any of claims 1 to 7, wherein it is arranged to measure the presence of introduced motion unsharpness before or during said selective exposure.

9. The system as claimed in claim 8, wherein the motion unsharpness is determined in dependence on the detection of temporal intensity variations in a single image element.

10. The system as claimed in claim 8, wherein the motion unsharpness is determined in dependence on the

detection of temporal image position variations for a predetermined detail on a medical film.

11. The system as claimed in any of claims 1 to 10, wherein it is arranged to regulate the light intensity of the light surface in dependence on the dynamic range of a particular medical film.

12. The system as claimed in any of claims 1 to 10, wherein it comprises a diaphragm in front of the camera, the aperture of which is arranged in dependence on the dynamic range of a particular medical film.

13. A system for image archiving and communication, particularly a system of the PACS (Picture Archive Communications System) type, **characterized in** that it comprises at least one system (1) for transfer of medical films (17), particularly X-ray films, or parts thereof, as claimed in any of claims 1 to 12.

14. A method for transfer of medical films, particularly X-ray films, or parts thereof, for diagnostics to digital, electronic form and for archiving of these digital, electronic images, **characterized by** using a digital camera (11) attached to a positioning system (15) or the like and a screen (25), said digital camera being connected partly to the screen, partly to a digital, electronic image archive, such that
- medical films arranged on a light surface are selectively examined on the screen or in the finder of the camera in order to find pathologically interesting parts,
- medical films, or parts thereof, are selectively magnified with found pathologically interesting parts,
- medical films, or parts thereof, are selectively exposed, and

- obtained digital, electronic, medical images are transferred to and stored in the digital, electronic image archive.

15. The method as claimed in claim 14, wherein medical films, which are comprised of X-ray films, are arranged in a light cabinet (21) and said digital camera (11) with positioning system (15) is arranged in front of said light cabinet.

16. The method as claimed in claim 14 or 15, wherein the films, or parts thereof, are transferred by personnel having diagnostic competence in connection with prediagnostics.

17. The method as claimed in claim 14 or 15, wherein the films, or parts thereof, are transferred by clinically qualified personnel in connection with diagnostics or consultation, particularly during an X-ray round.

18. The method as claimed in claims 14 to 17, wherein patient-related data is input and stored together with the obtained digital, electronic, medical images in the digital, electronic image archive.

19. The method as claimed in claim 18, wherein the digital, electronic image archive is comprised of a PACS (Picture Archive Communications System) and the data storage is performed by communication with a patient information system RIS (Radiological Information System) included in the PACS.

20. The method as claimed in any of claims 14 to 19, wherein the presence of introduced motion unsharpness before and during said selective exposure is measured.

21. The method as claimed in claim 20, wherein the motion unsharpness is determined in dependence on the detection of temporal intensity variations in a single image element.

22. The method as claimed in claim 20, wherein the motion unsharpness is determined in dependence on the detection of temporal image position variations for a predetermined detail on a medical film.

23. The method as claimed in any of claims 14 to 22, wherein the light intensity of the light surface is regulated in dependence on the dynamic range of a particular medical film.

24. The method as claimed in any of claims 14 to 22, wherein a diaphragm is arranged in front of the camera in dependence on the dynamic range of a particular medical film.

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SYSTEM AND METHOD FOR IMAGE TRANSFER OF MEDICAL FILM

TECHNICAL FIELD

The present invention relates to a system and a method, respectively, for transfer of medical films, particularly X-ray films or parts thereof, for diagnostics to digital, electronic form and for filing of these digital, electronic images.

BACKGROUND OF THE INVENTION AND RELATED ART

From the start of X-ray diagnostics it has been common practice to compare films from different examinations of a patient as required. The main purpose is to search for and to diagnose pathalogically interesting changes, e.g. of tumours. New techniques for imaging, such as e.g. ultrasonics and nuclear magnetic resonance, have successively been introduced in parallel with the X-ray technique. To this also common photographic images are added as a supplementary aid.

A comparison between so-called old images from previous examinations and new images from a present examination is carried out either by hanging and examining existing films in front of a light surface, e.g. in a light cabinet, or by examining computerized, so-called digitized images on a computer screen. The diagnosis is rendered difficult to a varying extent if the comparison is not performed between old and new images at similar conditions and with the same tecnique, i.e. in a light cabinet or on a screen.

As regards examinations using X-rays, a transition has during the latest five years successively taken place from so-called analogous film technique to so-called digital technique with screens and this transition is

estimated to continue during about 5 to 10 years for large and medium-sized diagnostic units and up to 15 years for smaller units.

An important diagnostic operation routine, particularly for large and medium-sized diagnostic units, is the so-called round system, which in principle comprises a consultation between clinics with different specialist competence, including diagnosticians, mainly within X-ray, ultrasonic sound and magnetic resonance imaging (MRI). During the rounds the respective clinics are going through the basis for all or selected examinations together with the diagnostician reporting on the case before determining the patient diagnosis that is at hand. The number of participants of the round varies from a few to about twenty. The number of rounds tends to increase but with fewer participants, principally dependent on the possibility of a greater flexibility at the presentation on digital screens within the diagnostic unit. Examinations using computer tomography, ultrasonic sound and magnetic resonance imaging are often presented with various image divisions, the number of which may vary from two to twenty, of the same object, which correspondingly makes the readability more difficult due to the decreasing size of the images. Therefore, some light cabinets have been completed with a video system, which comprises a movable video camera in front of the light surface and a television monitor for presentation of enlarged films.

In order to meet the demand of image examination during similar conditions and preferably using the same technique old films are transferred to digital, electronic form by so-called scanning. The films are then placed into a scanner, which is a closed unit, for reading and transfer, such as a data file, to a digital archive, e.g. in a PACS (Picture Archiving and Communications

System), which is a complete digital information system comprising a digital image archive with a network for image transfer between screens both within a diagnostic unit and between different diagnostic units.

The transfer of film to digital image archives by scanning of film and other documentation of patient examinations involves a severely increased work effort and administration within the diagnostic unit, even if this is made selectively and may be limited to arising demands. Thus, diagnostic units, which during transition to digital technique, determine not to archive or store film, have to transfer all film by scanning. To transfer a conventional film archive in its entirety must be considered as a very comprehensive work effort and may hardly be motivated, since the comparison between old and new images usually needs to be performed when it has been found necessary. The film archives usually comprise a large number of films depending on the request prescribed by law to archive 10 years of film production on a running basis. In a regional/university hospital the film archive comprises about 10 million films, in a general hospital about 4 to 5 million films and in a smaller hospital about 1.5 to 1.8 million films spread over a ten years period.

The reading time for each scanned film is about a minute. In practice the complete process, including taking out or transfer patent documentation takes 15 to 20 minutes for each patient and examination. To transfer the film archive in this manner to a digital archive requires an almost unreasonable and costly work effort corresponding to about 1500 man years for each regional hospital, about 600 man years for each central hospital and about 200 man years for each smaller hospital.

When the film is moved from the film archive or the light cabinet for being put into the scanner there is a certain risk for the film being by mistake turned in the wrong way. The risk is particularly great when the work is carried out by less qualified personnel.

Conventional scanning is only in exceptional cases carried out by radiologists, since the diagnostic moment of the process constitutes a lesser part of the entire work. Therefore, the major part of the work is transferred to less qualified manpower with some guidance of the radiologist. In this way an important part of the diagnostic valuation is jeorpardized in respect of accurate selection of old films within pathologically interesting areas from previous examinations.

Conventional scanners are intended to transfer a complete film of occurring format and without any possibility for diagnostic discrimination, e.g. partial enlargement of pathologically interesting areas, partly because the scanner normally lacks the technical function for enlargement, partly because the scanner is closed and thus hides the film from examination and choice of enlarged area.

Thus, when a conventionally scanned film is partially enlarged on a screen, the image quality will be deteriorated proportionally to the degree of enlargement, as the number of picture elements, or pixels, will remain constant for the different parts of the image. A pathalogically interesting area is considered to have n pixels in x and y dimensions without any magnification. At 2 times magnification the number of pixels will be halved to the number of n/2, i.e. the resolution of the image will be deteriorated with 50%. It is also possible to describe the technique in such a way that the

pixels are magnified proportionally to the object magnification.

Using such a conventional, more or less systematical scanning there is thus a risk that important pathological areas are lost, which may lead to difficulties when making diagnosis and even to erroneous diagnosis.

An alternative in this respect is to use scanners having very high resolution. They are, however, very expensive and further they involve a heavily increased need of storing capacity in the image archive and a heavily increased time consumption for the image transfer. A doubling of the resolution of the scanner will e.g. give a quadrupling of the storage need for the image in the archive and of an image transfer time. A conventional scanning will not, for practical reasons as regards time and resources, admit that appropriate films and parts thereof are selected for internal consultation during a round in order later to be used for determining the clinic diagnosis.

Further, a conventional scanning does not allow that photographic images of diagnostic interest, e.g. images of patients having so-called scolios backs, are transferred as a supplementary aid to the rest of the image basis of the patient.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a system for image transfer of medical images, particularly X-ray images, or parts thereof, for diagnosis to digital, electronic form and for archiving of these digital, electronic images, which system lacks one or several of the problems, which may arise using a known scanning system.

This and other objects are according to one aspect of the invention attained by a system for transfer of medical images as defined in claim 1.

According to a second aspect of the present invention there is provided a system for image archiving and communication, particularly a system of the PACS (Picture Archiving and Communications System) type as defined in claim 13.

Is is a further object of the invention to provide a method for said type of image transfer.

This object is according to a third aspect of the present invention attained by a method for transfer of medical images as definied in claim 14.

An advantage of the present invention is that it provides for flexible, fast, accurate and simple image transfer, which makes it ideal with teleradiologi.

A major advantage of the invention, compared with conventional scanners, is that the image for digitalization may be looked at and judged and, if required, adapted before the digitalization is performed and thus not afterwards.

A further advantage of the invention is that a selective partial enlargement of pathologically interesting areas is made possible, whereby parts only of some images have to be transferred, which involves a considerably saving as regards partly transfer time, partly storing space in the digital, electronic archive in comparison with use of a conventional scanner having an extremely high image resolution.

Yet a further advantage of the present invention is that image transfer may be performed in connection with an X-ray round or prediagnostics, wherein pathologically interesting objects may optionally be magnified and transferred to a digital, electronic archive.

A particular advantage of the invention is that it hereby lifts the transfer process up to an appropriate level as the method motivates persons having diagnostic competence to optimize the basis for diagnostic consultation and final opinion. The risk for turning the film upside-down in a scanner is reduced.

Further advantages of the invention will be apparent from the following description.

SHORT DESCRIPTION OF THE DRAWINGS

The invention will now be described closer below with reference to Fig. 1, which is given by way of illustration only and shall therefore in no way limit the invention.

Fig. 1 is a perspective view of an embodiment of a system for transfer of medical images according to the present invention.

PREFERRED EMBODIMENTS

In the following description, for describing and not limiting purposes, specific details are set forth in order to provide a thorough understanding of the present invention. However, it is obvious to the man skilled in the art that the invention may be practised in other embodiments, which deviate from these specific details. In other instances, detailed descriptions of well-known techniques are omitted in order not to ob-

scure the description of the present invention with unnecessary details.

The terms "images" and "film", respectively, in this description principally refer to developed X-ray film but any other kind of image or film for medical application shall be included in these terms.

With reference to Fig. 1, a system 1 for transfer of medicial images, particularly X-ray images, according to the present invention comprises a highly resolving digital camera 11 of the CCD type with a lens 13 mounted at a positioning system 15. The camera can be of conventional kind, which is available on the commercial market and may typically comprise about 1000-2000 x 1000-2000 picture elements or pixels or may be a professional camera with a considerably higher resolution than e.g. a conventional scanner in dependence on the demands and the desires of the radiologist. The lens is preferably comprised of an objective with a magnification function, i.e. a zoom objective, and a positioning system 15 is preferably comprised of a vertical pole 15a, a coordinate slider 15b and a list 15c. The digital camera is arranged such that it may at least be movable in a plane parallel to the plane, in which the medical images 17 to be transferred are arranged.

Preferably, the medical images 17 to be transferred are arranged on a vertical light surface 19 in e.g. a light cabinet 21 as illustrated in Fig. 1, but they may alternatively be arranged directly at a wall or other substantially plane surface (not shown). The camera, which in Fig. 1 is movable in a vertical direction through movement along the vertical pole 15a and laterally through movement of the coordinate slider 15b along the list 15c, may, however, also be movable in a third di-

rection, at right angles to the above-mentioned directions.

The digital camera 11 is connected to a computer 23, integrated in the system 1, with a screen 25, via an input/output 27 arranged at the camera, which computer is in turn connected to a digital electronic image archive (not shown in Fig. 1) through a cable 29. Alternatively, the digital camera 11 may be directly connected to a computer in a digital information system of a diagnostic unit on the assumption that the necessary technical adaption is performed.

The system 1 is arranged in such a way that the transfer may comprise the following points:

- Positioning of the digital camera for scanning of medical images.
- Examination of the medical images either in the finder of the camera (if it is provided with a finder) or on the screen 25. This examination may be selectively performed i.a. in order to find pathologically interesting parts.
- Magnification of selected images or parts thereof of the group of examined images, particularly the ones having pathologically interesting parts, to an optional degree limited by the magnification capacity of the camera only, i.e. the longest focal distance and the closest imaging distance of the zoom objective. By choosing an appropriate equipment the actual resolution, which may be achieved and by which images may be transferred, is equal to the resolution of the original images

(which is in the same order of magnitude as the grain size of the chemically developed film).

- Exposure of images, or parts thereof. In this respect occurring films may be imaged with any resolution within the range of the performance of the system and the resolution of the original images.

- Transfer of any images to the digital electronic image archive. This is preferably comprised of a system of the PACS type, which is an integrated network-based system for medical information. The transfer may comprise communication with a patient information system RIS (Radiological Information System) included in the PACS for input of patient data and other data and conversion of the images to a suitable format for the PACS.

One of the advantages of using a computer for image transfer is, as mentioned, that the operator, during positioning of the camera and choice of partial enlargement, may, except of using the finder of the camera, examine images on the screen of the computer before the digitalization of the image. The operator is preferably a clinically qualified person with knowledge about diagnostic discrimination. The invention motivates persons with diagnostic knowledge to perform the transfer process simultaneously with the optimization of the basis for diagnostic consultation and final statement.

Another advantage is that the screen of the computer or, when necessary, a secondary device and, for the purpose, a more highly resolving screen may be used for the image exposure and thereby the risk for motion

blurr will be reduced, which may arise at heavy image magnification and incautious contact with the camera during exposure.

The system may be arranged for manual and preferably motorized (not shown) movement of the digital camera in the horizontal and vertical directions. The camera may in this respect be arranged for scanning of a film examination surface, particularly in a light cabinet.

The video output of the camera may be used for image presentation during the round routine consultation for diagnostics and in such a case either via the computer, which is connected to the digital camera, or via external screens included in the digital image system of the unit.

To connect selected film examination with magnification of pathologically interesting objects to PACS and other types of digital image archives is time saving and may be performed by clinically qualified personnel when practising out internal prediagnostics and consultation during the round routine. When necessary, the complete work, or parts thereof, may be prepared before the round.

The system for image transfer of film to the digitial system of the diagnostic unit may further present occurring films with elucidating magnification at team work for diagnostic consultations.

By performing image presentation and transfer of film already arranged in a light cabinet the risk for erroneously turned films is also reduced.

There is undebatably a great need for image transfer of analog film to digital image archives and with a possi-

bility to enlarge pathologically interesting objects and simultaneously preparing an optimal judgement basis for determining of a clinical diagnosis.

A drawback of the image transfer is the risk for introduction of undesired and unintended motion unsharpness, which may make a planned and expected result of an approaching diagnosis for the patient difficult and even impossible.

The risk for motion unsharpness to arise using the present invention is considerably higher than using a conventional scanner, which consists of a closed system where neither the camera nor the film may be affected by external contact. The image deterioration due to motion unsharpness will increase with increased magnification of the object. There are mainly two types of motion unsharpness, namely a moderate decaying motion (e.g. after a hit) and a constant motion (e.g. a permanent vibration caused by an electrical apparatus).

Contact with film and/or camera in connection with camera exposure and image transfer will to a varying degree generate a motion unsharpness for the imaged object, which will increase proportionally to the used magnification level.

There is a risk that the user will not observe the motion unsharpness arising after activation of the camera exposure but before the exposure and storage of the image/film for image transfer. Rejection of films after scanning involves that important diagnostic patient information is irrevocably lost and in order to prevent this, each scanned film should need to be examined separately before rejection.

The motion unsharpness may, according to the present invention, be carried out through active, dynamic image analysis of the camera image in one or two steps. By e.g. measuring the position, i.e. the coordinates for a selected detail on the film at two different occasions, a motion may be detected. Thus, the motion unsharpness is determined depending on the fact that temporal image position variations for a predetermined detail of a medical film are detected. Alternatively, the motion unsharpness is determined depending on the fact that the temporal intensity variations in a simple image element are detected.

The allowed value of the motion may either be chosen according to a predetermined value or be given by the user from case to case.

Step 1 implies that the exposure of the image is prevented (e.g. the exposure mechanism is locked) when the allowed value of the motion unsharpness is exceeded before exposure. Step 2 implies that the image transfer is stopped (i.e. an exposed image is directly rejected), when the allowed value of the motion unsharpness is exceeded for an exposed image.

The prevented or stopped image transfer may either be absolute or be a temporary obstacle in the form of an option that the image does not comply with the demands put on the resolution but may anyhow be exposed and/or transferred to the digital archive if the user accepts this deviation.

The motion unsharpness caused by permanent vibration with constant amplitude may be compensated by making an average image of more picture fields with digital image analysis.

To sum up, supervision and measure in respect of motion unsharpness are based on comparison of the coordinates of the image matrix at two different occasions, e.g. before and after the exposure of the image.

In order to optimize the contrast of the image the strength of the light ought to be adapted to the individual density range of the images, which involves an unnecessary operation moment, since the image examination per se does not necessarily demand this light regulation. Depending on the use frequency this may be tiring and disturb the diagnostic work.

If this light regulation shall be made using a conventional scanner, it may at first be performed after judgement of the already digitized film, whereby the complete process may be repeated again when necessary.

Light regulation in order to optimize the contrast of the image has a very great diagnostic value. The invention makes possible choice of a so-called dynamic contrast optimization, i.e. the contrast ranges of the image is utilized over the entire grey scale or a manually chosen contrast level.

Possibly, the camera may also be provided with a diaphragm, which automatically chooses the aperture depending on the dynamic range of the film.

To sum up, by means of the system according to the invention, any images, particularly magnifications with improved resolution of pathologically interesting parts, and flexible image transfers to the digital system of the diagnostic unit for image processing and archiving may be performed using a film of already made patient examinations. By combining film examination with magnification/digitalization/reading/storing in

connection with the round routine pathologically interesting objects may optionally be magnified for simultaneous consultation and transfer to a digital image archive.

Partial magnification of pathologically interesting objects is an enormous advantage in comparison with conventional scanning with limited resolution and a considerable saving of image storage and transfer time in comparison with using a conventional scanner with extremely high image resolution. When transferring the entire image, an unnecessary large image surface will then be stored with unused image resolution and will have a correspondingly larger storage space in the digital archives at its disposal in comparison with the invention.

The transfer system according to the present invention is flexible, fast, accurate and simple to use, which results in an ideal system for teleradiology over network.

The present invention as described above solves the problems, which are associated with known technique. It is, of course, not limited to the embodiments described above and shown in the drawings but can be modified within the scope of the appended patent claims.

CLAIMS

1. A system for transfer of medical films, particularly X-ray films, or parts thereof, for diagnostics to digital, electronic form and for archiving these digital, electronic images, **characterized in** that it comprises a digital camera (11) attached to a positioning system (15), which camera is connected to a screen (25) and to a digital, electronic image archive for medical information, wherein said system is arranged for
- selective positioning of the digital camera and examination via the screen, or in the finder of the camera, of medical films (17) arranged on a light surface in order to find pathologically interesting parts of the films,
- selective magnification of medical films (17), or parts thereof, with found pathologically interesting parts found,
- selective exposure of medical films (17), or parts thereof, and
- transfer of obtained digital, electronic, medical images to and storing of them in the digital, electronic image archive.

2. The system as claimed in claim 1, wherein it is arranged in a light cabinet (21), or other light surface means, wherein said digital camera (11) with positioning system (15) is arranged for selective positioning and for examination via the screen, or in the finder of the camera, of medical films (17) arranged in said light cabinet.

3. The system as claimed in claim 1 or 2, wherein it comprises a computer (23) connected to said digital camera (11), to said screen (13) and to said digital, electronic image archive.

4. The system as claimed in any of claims 1 to 3, wherein it is, simultaneously with said transfer, arranged for use for diagnostics and consultation, particularly during an X-ray round.

5. The system as claimed in any of claims 1 to 4, wherein it is connected to a system for digital image archiving and communication of the PACS (Picture Archive Communications System) kind in such a way that said transfer comprises transferring the obtained digital, electronic images to and storing them in said system for digital image archiving and communication of the PACS kind.

6. The system as claimed in any of claims 1 to 5, wherein the digital camera (11) comprises a CCD chip and is provided with a zoom object (13).

7. The system as claimed in any of claims 1 to 6, wherein the positioning system (15) comprises a vertical pole (15a) and a coordinate slider (15b) and the digital camera is arranged to be movable, particularly by a motor, vertically and horizontally.

8. The system as claimed in any of claims 1 to 7, wherein it is arranged to measure the presence of introduced motion unsharpness before or during said selective exposure.

9. The system as claimed in claim 8, wherein the motion unsharpness is determined in dependence on the detection of temporal intensity variations in a single image element.

10. The system as claimed in claim 8, wherein the motion unsharpness is determined in dependence on the

detection of temporal image position variations for a predetermined detail on a medical film.

11. The system as claimed in any of claims 1 to 10, wherein it is arranged to regulate the light intensity of the light surface in dependence on the dynamic range of a particular medical film.

12. The system as claimed in any of claims 1 to 10, wherein it comprises a diaphragm in front of the camera, the aperture of which is arranged in dependence on the dynamic range of a particular medical film.

13. A system for image archiving and communication, particularly a system of the PACS (Picture Archive Communications System) type, **characterized in** that it comprises at least one system (1) for transfer of medical films (17), particularly X-ray films, or parts thereof, as claimed in any of claims 1 to 12.

14. A method for transfer of medical films, particularly X-ray films, or parts thereof, for diagnostics to digital, electronic form and for archiving of these digital, electronic images, **characterized by** using a digital camera (11) attached to a positioning system (15) or the like and a screen (25), said digital camera being connected partly to the screen, partly to a digital, electronic image archive, such that
- medical films arranged on a light surface are selectively examined on the screen or in the finder of the camera in order to find pathologically interesting parts,
- medical films, or parts thereof, are selectively magnified with found pathologically interesting parts,
- medical films, or parts thereof, are selectively exposed, and

- obtained digital, electronic, medical images are transferred to and stored in the digital, electronic image archive.

15. The method as claimed in claim 14, wherein medical films, which are comprised of X-ray films, are arranged in a light cabinet (21) and said digital camera (11) with positioning system (15) is arranged in front of said light cabinet.

16. The method as claimed in claim 14 or 15, wherein the films, or parts thereof, are transferred by personnel having diagnostic competence in connection with prediagnostics.

17. The method as claimed in claim 14 or 15, wherein the films, or parts thereof, are transferred by clinically qualified personnel in connection with diagnostics or consultation, particularly during an X-ray round.

18. The method as claimed in claims 14 to 17, wherein patient-related data is input and stored together with the obtained digital, electronic, medical images in the digital, electronic image archive.

19. The method as claimed in claim 18, wherein the digital, electronic image archive is comprised of a PACS (Picture Archive Communications System) and the data storage is performed by communication with a patient information system RIS (Radiological Information System) included in the PACS.

20. The method as claimed in any of claims 14 to 19, wherein the presence of introduced motion unsharpness before and during said selective exposure is measured.

21. The method as claimed in claim 20, wherein the motion unsharpness is determined in dependence on the detection of temporal intensity variations in a single image element.

22. The method as claimed in claim 20, wherein the motion unsharpness is determined in dependence on the detection of temporal image position variations for a predetermined detail on a medical film.

23. The method as claimed in any of claims 14 to 22, wherein the light intensity of the light surface is regulated in dependence on the dynamic range of a particular medical film.

24. The method as claimed in any of claims 14 to 22, wherein a diaphragm is arranged in front of the camera in dependence on the dynamic range of a particular medical film.

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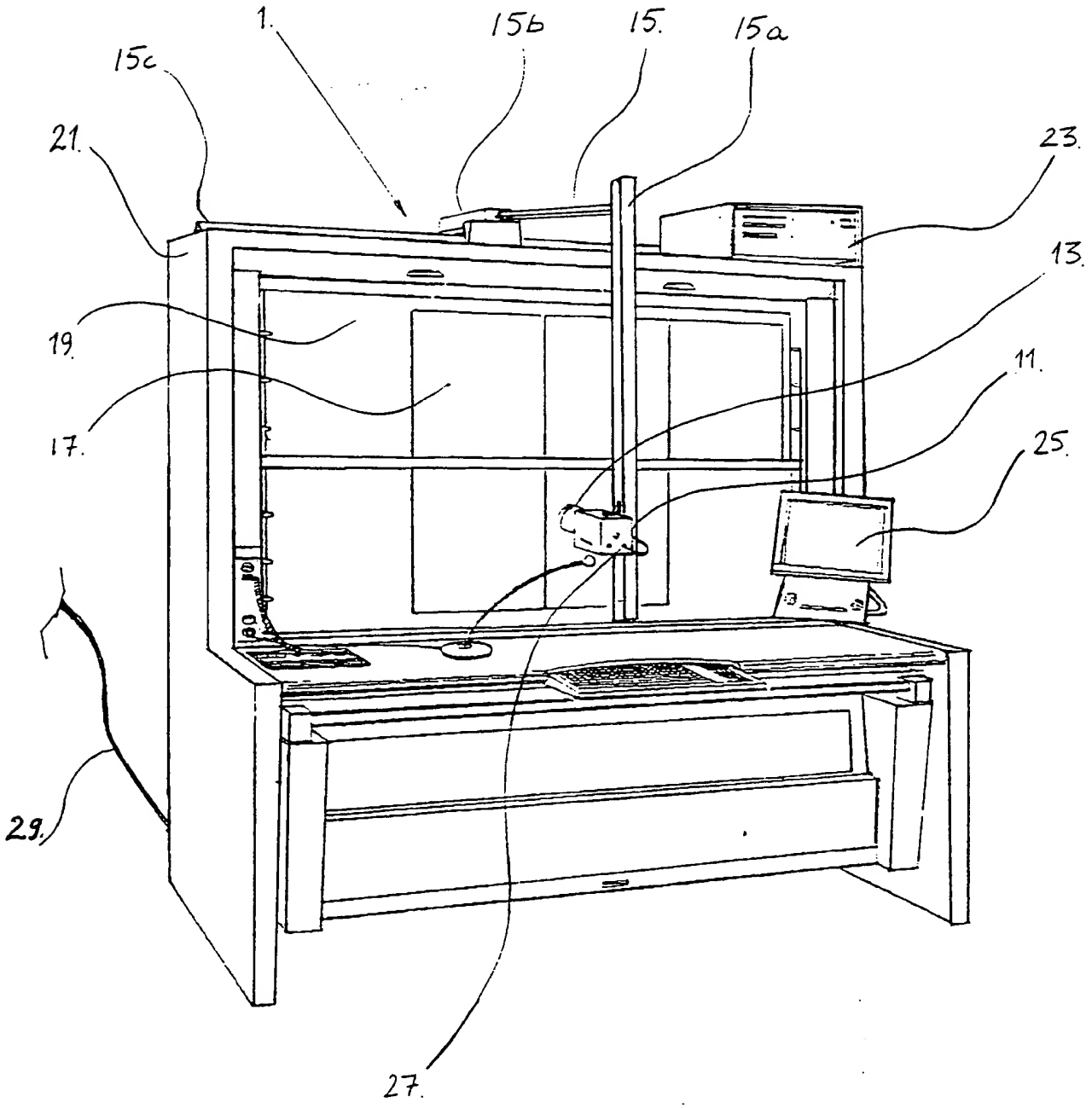

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/02117

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04N 7/18
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04N, A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4203447 A1 (DIGITAL DAIGNOSTIK IN DEUTSCHLAND GMBH), 12 August 1993 (12.08.93), column 3, line 68 - column 4, line 65; column 5, line 19 - line 21; column 7, line 55 - line 60, figure 1, claims 1-24	1-24
A	US 5537226 A (GEORGE WOLBERG ET AL), 16 July 1996 (16.07.96), see whole document	8-10,20-22
A	US 5633674 A (JAMES TRULASKE ET AL), 27 May 1997 (27.05.97), column 2, line 27 - line 31, figure 1	1,14

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 April 2000	20-04-2000
Name and mailing address of the ISA: Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Erik Veillas/CL Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/02117

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 3441163 A1 (ELSCINT LTD), 18 July 1985 (18.07.85), page 6, line 15 - line 23 --	1,14
A	EP 0838767 A2 (FUJI PHOTO FILM CO., LTD), 29 April 1998 (29.04.98), see whole document -- --------	1-24

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 99/02117

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4203447 A1	12/08/93	NONE	
US 5537226 A	16/07/96	JP 8237476 A	13/09/96
US 5633674 A	27/05/97	US 5729283 A	17/03/98
DE 3441163 A1	18/07/85	FR 2555002 A	17/05/85
		IL 73388 A	15/05/89
		JP 1841960 C	12/05/94
		JP 5052215 B	04/08/93
		JP 60151744 A	09/08/85
		NL 193484 B	01/07/99
		NL 8403454 A	03/06/85
		US 4590518 A	20/05/86
EP 0838767 A2	29/04/98	JP 10187953 A	21/07/98

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PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/SE 99/02117

International Application No.

18 -11- 1999

International Filing Date

The Swedish Patent Office
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* RF 99695

Box No. I TITLE OF INVENTION

System and method for image transference of medical film

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

AO:s Metall & Mek. Verkstad AB
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☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: Sweden

State *(that is, country)* of residence: Sweden

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

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Sweden

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality: Sweden

State *(that is, country)* of residence: Sweden

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is ~~hereby~~/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☐ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

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☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- ☒ **AP** **ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** **AT** Austria, **BE** Belgium, **CH and LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

- ☒ **AE** United Arab Emirates
- ☒ **AL** Albania
- ☒ **AM** Armenia
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- ☒ **CZ** Czech Republic
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- ☒ **ES** Spain
- ☒ **FI** Finland
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- ☒ **GE** Georgia
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- ☒ **IN** India
- ☒ **IS** Iceland
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- ☒ **LS** Lesotho
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- ☒ **MD** Republic of Moldova
- ☒ **MG** Madagascar
- ☒ **MK** The former Yugoslav Republic of Macedonia
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- ☒ **MW** Malawi
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- ☒ DM Dominica
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Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 19 Nov 1998 19.11.98	9803964-7	Sweden		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): 1

* *Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* :

ISA/ SE

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority)*:

Date *(day/month/year)* Number Country *(or regional Office)*

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	:	3
description (excluding sequence listing part)	:	13
claims	:	5
abstract	:	1
drawings	:	1
sequence listing part of description	:	
Total number of sheets	:	23

This international application is **accompanied by** the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: Swedish

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Stockholm 18 November 1999

AO:s Metall & Mek. Verkstad AB Nino da Silva

by: Rolf Fritzon

Rolf Fritzon

1999 -11- 18

For receiving Office use only

1. Date of actual receipt of the purported international application: 18 -11- 1999
2. Drawings: ☒ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA/SE
6. ☐ Transmittal of search copy delayed until search fee is paid.

For International Bureau use only

Date of receipt of the record copy by the International Bureau: 20 JAN 2000 (20.01.00)

1/1

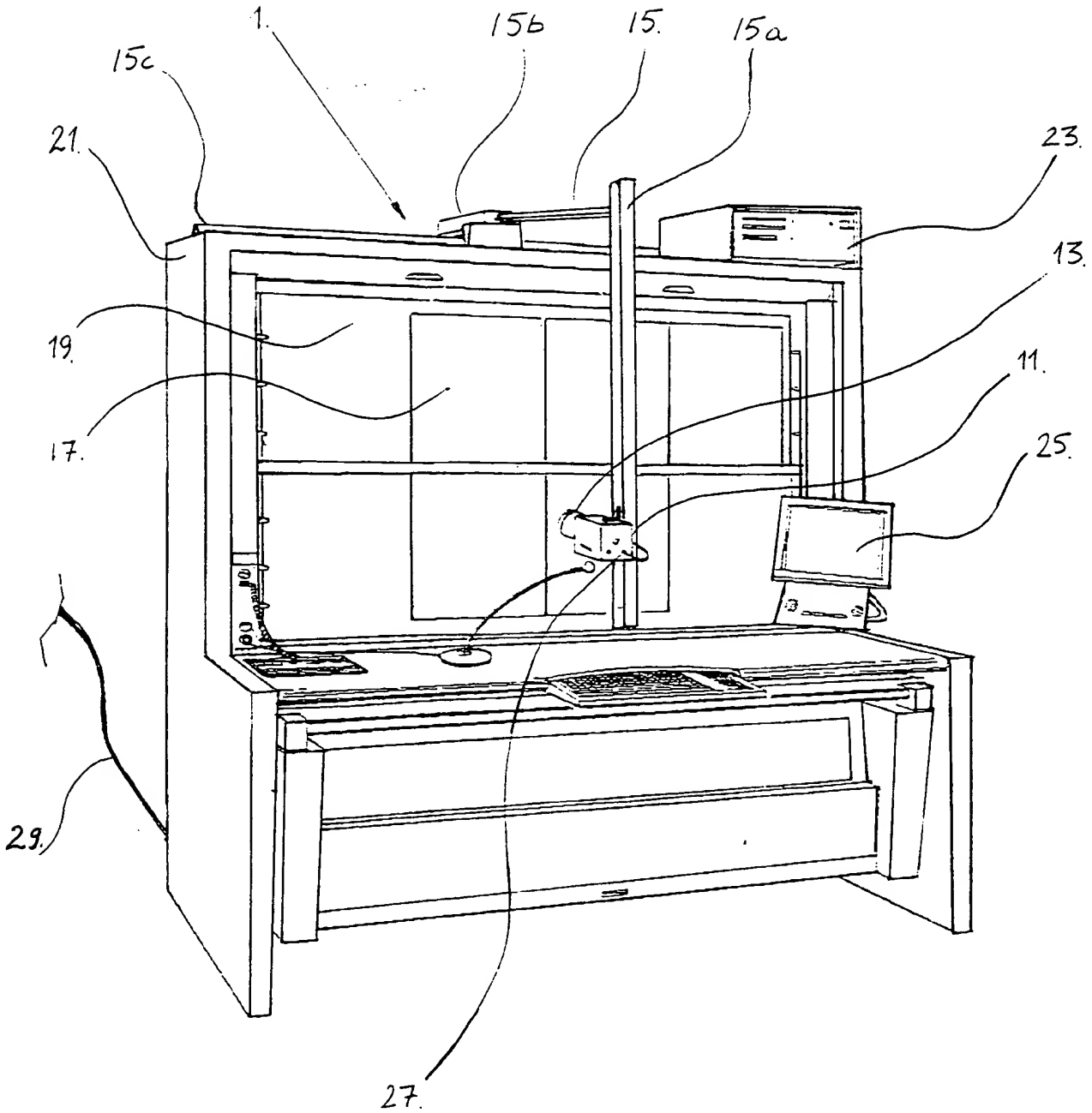

Fig. 1

PCT/SE99/02117
18-11-1999

SYSTEM OCH FÖRFARANDE FÖR BILDÖVERFÖRING AV MEDICINSK FILM

TEKNISKT OMRÅDE

Föreliggande uppfinning avser ett system respektive ett förfarande för överföring av medicinska filmer, särskilt röntgenfilmer, eller delar därav, för diagnostik till digital, elektronisk form och för arkivering av dessa digitala, elektroniska bilder.

TEKNIKENS STÅNDPUNKT

Från röntgendiagnostikens början har det varit allmän praxis att vid behov jämföra filmer från en patients olika undersökningar. Det huvudsakliga syftet är att söka och diagnostisera patologiskt intressanta förändringar, t.ex. av tumörer. Ny teknik för avbildning, som t.ex. ultraljud och magnetresonans, har successivt införts parallellt med röntgentekniken. Till detta kommer även såsom komplement vanliga fotografiska bilder.

Jämförelsen mellan s.k. gamla bilder från tidigare undersökningar och nya bilder i aktuell undersökning sker antingen genom att hänga och granska förekommande filmer framför en ljusyta, t.ex. i ett ljusskåp, eller att granska datoriserade s.k. digitaliserade bilder på en bildskärm. Diagnosen försvåras, i varierande grad, om inte jämförelsen mellan gamla och nya bilder granskas under lika förhållanden och med samma teknik, dvs. på ljusskåp eller på bildskärm.

Vad det gäller undersökningar med röntgen har under de senaste ca fem åren en successiv övergång från s.k. analog filmteknik till s.k. digital teknik med bildskärm påbörjats och denna övergång uppskattas fortsätta under cirka 5-10 år för stora och medelstora diagnostiska enheter och upp till 15 år för mindre enheter.

En viktig och diagnostisk arbetsrutin, för i synnerhet stora och medelstora diagnostiska enheter, är det s.k. rondsystemet. Rondsystemet omfattar i princip en konsultation mellan kliniker med olika specialkompetens och diagnostiker främst inom röntgen, ultraljud och MR (MRI, Magnetic Resonance Imaging). Under ronden går respektive kliniker igenom underlaget för samtliga eller valda undersökningar med föredragande diagnostiker inför faställande av förestående patientdiagnos. Antalet deltagare under ronden varierar från några få till ca tjugo. Antalet ronder tenderar att öka, men med färre deltagare, främst beroende på möjligheten till större flexibilitet vid presentation på digitala bildskärmar inom den diagnostiska enheten. Undersökningar med datortomografi, ultraljud och MR presenteras ofta med olika bilddelningar, vars antal kan variera från två till tjugo, av samma objekt, vilket i motsvarande grad försvårar läsbarheten genom bildernas minskade storlek. Därför har vissa ljusskåp kompletterats med ett videosystem, som består av en framför ljusytan flyttbar videokamera och en TV-monitor för presentation av förstorade filmer.

För att tillgodose kravet på bildgranskning under likartade förhållanden och företrädesvis användande samma teknik överförs gamla filmer till digital, elektronisk form genom s.k. scanning. Filmen placeras då i en scanner, som är en sluten låda, för avläsning och överföring såsom en datafil till ett digitalt arkiv, exempelvis i ett PACS-system (Picture Archiving and Communications System), som är ett komplett digitalt informationssystem omfattande ett digitalt bildarkiv med nätverk för bildöverföring mellan bildskärmar både inom en diagnostisk enhet och mellan olika diagnostiska enheter.

Överföring av film till digitala bildarkiv genom scanning av film och annan dokumentation av patientundersökningar medför en kraftigt ökad arbetsinsats och administration inom den diagnostiska enheten även om detta görs selektivt och kan begränsas till uppstående behov. Diagnostiska enheter, som vid

övergång till digital teknik, beslutar att inte arkivera eller lagra film, måste då överföra all film genom scanning. Att överföra ett konventionellt filmarkiv i sin helhet får betraktas som en mycket omfattande arbetsinsats och kan knappast motiveras genom att jämförelsen mellan gamla och nya bilder vanligtvis behöver genomföras på förekommen anledning. Filmarkiven innehåller som regel ett stort antal filmer beroende på det lagstadgade kravet att löpande arkivera 10 års filmproduktion. På ett region/universitetssjukhus innehåller filmarkivet cirka 10.000.000 filmer, på ett centrallasarett cirka 4-5.000.000 filmer och på ett länsdelslasarett cirka 1.500-1.800.000 filmer fördelade över en tioårsperiod.

Avläsningstiden för varje scannad film är cirka en minut. I praktiken tar hela processen inklusive framtagning eller överföring av patientdokumentation 15-20 minuter per patient och undersökning. Att på detta sätt överföra hela filmarkivet till ett digitalt arkiv kräver en nära nog orimlig och kostsam arbetsinsats motsvarande cirka 1.500 manår för varje regionsjukhus, cirka 600 manår för varje centrallasarett och cirka 200 manår för varje länsdelslasarett.

När filmen flyttas från filmarkivet eller ljusskåpet för insättning i scannern, föreligger viss risk för att filmen av misstag blir felvänd. Risken är särskilt stor, då arbetet utföres av mindre kvalificerad personal.

Konventionell scanning utföres endast undantagsvis av radiologer, eftersom processens diagnostiska moment utgör en mindre del av hela arbetet. Därför överlåtes merparten av arbetet till mindre kvalificerad arbetskraft under viss ledning av radiologen. Därmed riskeras att en viktig del av den diagnostiska värderingen förloras avseende noggrant urval av gamla filmer med patologiskt intressanta områden från tidigare undersökningar.

Konventionella scanrar är avsedda att överföra en hel film av förekommande format och utan möjlighet till diagnostisk urskiljning, t.ex. delförstoring av patologiskt intressanta områden, dels genom att scannern normalt saknar den tekniska funktionen för förstoring, dels genom scannern är sluten och därmed döljer filmen för granskning och val av förstorat område.

När således en konventionellt scannad film delförstoras på en bildskärm, försämras bildkvaliteten proportionellt med förstoringsgraden genom att antalet bildelement, eller pixlar, förblir konstant för bildens olika delar. Ett patologiskt intressant område antas ha n stycken pixlar i x- och y-led utan förstoring. Vid 2 gångers förstoring halveras antalet pixlar till antalet n/2 stycken dvs. bildens upplösning försämras med 50 %. Man kan också beskriva tekniken med att pixlarna förstoras proportionellt med objektförstoringen.

Vid sådan konventionell, mer eller mindre systematisk scanning finns det följaktligen risk att viktiga patologiska områden missas, vilket kan leda till svårigheter vid diagnos och t.o.m. till feldiagnos.

Ett alternativ härvidlag är att använda scanners med mycket hög upplösning. Dessa är emellertid mycket dyra och dessutom medför de ett kraftigt ökat behov av lagringskapacitet i bildarkivet samt en kraftigt ökad tidskonsumtion för bildöverförande. T.ex. medför en fördubbling av scannerns upplösning en fyrdubbling av bildens lagringsbehov i bildarkivet samt en bildöverföringstid.

Konventionell scanning medger heller inte, av praktiska tids- och resursskäl, att lämpliga filmer och delar därav selekteras för intern konsultation under en rond för att senare användas för att fastställa den kliniska diagnosen.

Konventionell scanning medger i regel heller inte att fotografiska bilder av diagnostiskt intresse, t.ex. bilder av

patienter med s.k. skoliosryggar, överföres såsom ett komplement till patientens övriga bildunderlag.

REDOGÖRELSE FÖR UPPFINNINGEN

Det är ett ändamål med föreliggande uppfinning att tillhandahålla ett system för bildöverföring av medicinska bilder, särskilt röntgenbilder, eller delar därav, för diagnostik till digital, elektronisk form och för arkivering av dessa digitala, elektroniska bilder, vilket system är i avsaknad av ett eller flera av de problem som kan uppkomma med ett känt scanningsystem.

Detta och andra ändamål uppnås enligt en aspekt av uppfinningen med ett system för överföring av medicinska bilder såsom definieras av krav 1.

Enligt en andra aspekt av föreliggande uppfinning tillhandahålles ett system för bildarkivering och kommunikation, särskilt ett system av typen PACS (Picture Archiving and Communications System), såsom definieras av krav 13.

Det är ett ytterligare ändamål med uppfinningen är att tillhandahålla ett förfarande för nämnda typ av bildöverföring.

Detta ändamål uppnås enligt en tredje aspekt av föreliggande uppfinning med ett förfarande för överföring av medicinska bilder såsom definieras av krav 14.

En fördel med föreliggande uppfinning är att den ger flexibel, snabb, noggrann och smidig bildöverföring, vilket gör den idealisk inom teleradiologi.

En övergripande fördel med uppfinningen, jämfört med konventionella scanners, är att bilden för digitalisering kan betraktas och bedömas, samt vid behov anpassas, före det att digitaliseringen sker och således inte efteråt.

Ännu en fördel med uppfinningen är att selektiv delförstoring av patologiskt intressanta områden möjliggörs, varvid endast delar av vissa bilder behöver överföras, vilket innebär en väsentlig besparing avseende dels överföringstid, dels lagringsutrymme i det digitala, elektroniska arkivet jämfört med att använda en konventionell scanner med extremt hög bildupplösning.

Ytterligare en fördel med föreliggande uppfinning är att bildöverföring kan utföras i anslutning till en röntgenrond eller fördiagnostik, varvid patologiskt intressanta objekt valfritt kan förstoras och överföras till ett digitalt, elektroniskt arkiv.

En särskild fördel är att uppfinningen härvid lyfter upp överföringsprocessen på rätt nivå genom att metoden motiverar personer med diagnostisk kompentens att optimera underlaget för diagnostisk konsultation och slutligt utlåtande. Risken för felvändning i scanner minimeras.

Fler fördelar med uppfinningen framkommer i nedanstående beskrivning.

FIGURBESKRIVNING

Uppfinningen beskrivs närmare nedan under hänvisning till fig. 1, vilken enbart visas för att illustrera uppfinningen och skall därför ej på något sätt begränsa densamma.

Fig. 1 visar en perspektivvy av en utföringsform av ett system för överföring av medicinska bilder enligt föreliggande uppfinning.

FÖREDRAGNA UTFÖRINGSFORMER

I följande beskrivning, med beskrivande och inte begränsande avsikt, är specifika detaljer angivna för att tillhandahålla en grundlig förståelse av föreliggande uppfinning. Det skall emellertid inses av fackmannen inom området att uppfinningen kan

utövas i andra utföringsformer som avviker från dessa specifika detaljer. I andra fall är detaljerade redogörelser för känd teknik utelämnade för att inte fördunkla beskrivningen av föreliggande uppfinning med onödiga detaljer.

Med termerna "bilder" respektive "film" i denna beskrivning avses i första hand framkallad röntgenfilm, men varje annan typ av bild eller film för medicinsk tillämpning skall innefattas i begreppen.

Med referens till fig. 1 innefattar ett system 1 för överföring av medicinska bilder, särskilt röntgenbilder, enligt föreliggande uppfinning en högupplösande digital kamera 11 av typen CCD, med en lins 13, monterad vid ett positioneringssystem 15. Kameran kan vara av konventionellt slag som finnes på den kommersiella marknaden och innefatta typiskt ca 1000-2000 x 1000-2000 bildelement eller pixlar eller vara en professionell kamera med väsentligt högre upplösning än t.ex. en konventionell scanner i beroende av radiologens behov och önskemål. Linsen utgöres företrädesvis av ett objektiv med förstoringsfunktion, dvs. ett zoomobjektiv, samt positioneringssystemet 15 av en vertikal stolpe 15a, en koordinatvagn 15b och en list 15c. Den digitala kameran är anordnad att åtminstone kunna förflyttas i ett plan parallellt med det plan i vilket de medicinska bilderna 17, som skall överföras, är anordnade.

Företrädesvis är de medicinska bilderna 17 som skall överföras anordnade på en vertikal ljusyta 19 i t.ex. ett ljusskåp 21, såsom visas i fig. 1, men de kan även vara anordnade direkt på en vägg eller annan huvudsakligen plan yta (icke visat). Kameran, som i fig. 1 är förflyttningsbar i höjdled genom förflyttning längs den vertikala stolpen 15a och i sidled genom förflyttning av koordinatvagnen 15b längs listen 15c, kan emellertid även vara förflyttningsbar i en tredje riktning, vinkelrät mot ovan nämnda riktningar.

Den digitala kameran 11 är ansluten till en i systemet 1 ingående dator 23 med bildskärm 25 via en på kameran anordnad in/utgång 27, vilken dator i sin tur är ansluten till ett digitalt, elektroniskt bildarkiv (icke visat i fig. 1) via kabel 29. Alternativt kan den digitala kameran 11 vara direkt ansluten till en dator i en diagnostisk enhets digitala informationssystem under förutsättning att erfordrad teknisk anpassning utföres.

Systemet 1 är anordnat på ett sådant sätt att överföringen kan innefatta följande punkter:

- Positionering av den digitala kameran för avsökning av medicinska bilder.

- Granskning av de medicinska bilderna antingen i kamerans sökare (om den är utrustad med sådan) eller på bildskärmen 25. Denna granskning göres selektivt bl.a. för att hitta patologiskt intressanta delar.

- Uppförstoring av, ur gruppen med granskade bilder, valda bilder, eller delar därav, särskilt med patologiskt intressanta delar, i valfri grad begränsad endast av kamerans förstoringsförmåga, dvs. zoomobjektivets längsta brännvidd och närgräns. Genom lämpligt val av utrustning är den faktiska upplösningen som kan erhållas och med vilken bilder kan överföras lika med upplösningen i originalbilderna (vilken är i storleksordningen av kornstorleken hos den kemiskt framkallade filmen).

- Exponering av bilder, eller delar därav. Härvidlag kan förekommande filmer avbildas med valfri upplösning inom ramen för systemets prestanda och originalbildernas upplösning.

- Överskickande av valfria bilder till det digitala, elektroniska bildarkivet. Detta utgöres företrädesvis av ett

system av typen PACS, vilket är ett integrerat nätverksbaserat system för medicinsk information. Överskickandet kan innefatta kommunikation med ett i PACS ingående patientinformationssystem RIS (Radiological Information System) för inmatning av patientdata och annan data samt konvertering av bilderna till ett för PACS-systemet lämpligt format.

En av fördelarna med att använda en dator för bildöverföring är, såsom nämnts, att operatören under positionering av kamera och val av delförstoring, förutom att använda kamerans sökare, kan granska bilder på datorns bildskärm före bildens digitalisering. Operatören utgöres företrädesvis av en kliniskt kvalificerad person med kunskap om diagnostisk urskiljning. Uppfinningen motiverar personer med diagnostisk kompentens att utföra överföringsprocessen samtidigt med att underlaget för diagnostisk konsultation och slutligt utlåtande optimeras.

En annan fördel är att datorns bildskärm eller vid behov en sekundär anordning och för ändamålet en mer högupplösande bildskärm kan användas för kamerans bildexponering och därmed minskas risken för rörelseoskärpa, som kan uppstå under kraftig bildförstoring och oförsiktig beröring av kameran vid exponering.

Systemet kan anordnas för manuell eller företrädesvis motoriserad (icke visad) förflyttning av den digitala kameran i horisontal- och vertikalled. Kameran kan härvid anordnas för avsökning av en filmgranskningsyta, särskilt i ljusskåp.

Kamerans videoutgång kan användas för bildpresentation under rondrutinens konsultation för diagnostik och då antingen via datorn, som är kopplad till den digitala kameran, eller via externa bildskärmar ingående i enhetens digitala bildsystem.

Att koppla selekterad filmgranskning med förstoring av patologiskt intressanta objekt till PACS och övriga typer av

digitala bildarkiv är tidsbesparande och kan genomföras av kliniskt kvalificerad personal under utövande av intern fördiagnostik och konsultation under själva rondrutinen. Vid behov kan hela arbetet eller delar därav förberedas innan ronden.

Systemet för bildöverföring av film till den diagnostiska enhetens digitala system kan dessutom presentera förekommande filmer med förtydligande förstoring under grupparbete för diagnostiska konsultationer.

Genom att bildpresentation och överföring genomföres av redan i ett ljusskåp anordnad film, elimineras även risken för felvända filmer.

Det förefinns odiskutabelt ett stort behov av bildöverföring av analog film till digitala bildarkiv samt med möjlighet att kunna förstora patologiskt intressanta objekt och samtidigt framtagning av ett optimalt bedömningsunderlag för fastställande av en klinisk diagnos.

En nackdel med bildöverföringen är risken för införande av oönskad och oavsiktlig rörelseoskärpa, som kan försvårara och till och med omöjliggöra planerat och förväntat resultat av förestående diagnos för patienten.

Risken för att rörelseoskärpa uppstår med föreliggande uppfinning är avsevärt större än med en konventionell scanner, som består av ett slutet system där varken kamera eller film kan påverkas av extern beröring. Rörelseoskärpans bildförsämring ökar med ökad förstoring av objektet. Det finns huvudsakligen två typer av rörelsoskärpa, nämligen en dämpad, avklingande rörelse (t.ex. efter en stöt) och en konstant rörelse (t.ex. en permanent vibration orsakad av en elektrisk apparat).

Beröring av film och/eller kamera i anslutning till kameraexponering och bildöverföring kommer att i variende grad

generera rörelseoskärpa för det avbildade objektet, som ökar proportionellt med den använda förstoringsgraden.

Det finns risk för att användaren inte observerar rörelseoskärpa, som uppstår efter att kameraexponeringen aktiverats men före att själva bilden/filmen exponeras och lagras för bildövering. Kassation av filmer efter scanning innebär att viktig diagnostisk patientinformation oåterkallerligen förloras och för att förebygga detta skulle varje scannad film behöva granskas separat före kassation.

Rörelseoskärpan kan enligt föreliggande uppfinning åtgärdas genom aktiv, dynamisk bildanalys av kamerabilden i ett eller två steg. Genom att t.ex. mäta positionen dvs. koordinaterna för en vald detalj på filmen vid två olika tillfällen, kan en rörelse detekteras. Således fastställs rörelseoskärpan i beroende av att temporala bildpositionsvariationer för en förutbestämd detalj på en medicinsk film detekteras. Alternativt, fastställs rörelseoskärpan i beroende av att temporala intensitets-variationer i ett enskilt bildelement detekteras.

Rörelsens tillåtna värde kan antingen väljas efter ett förutbestämt värde eller anges av användaren från fall till fall.

Steg 1 innebär att bildens exponering förhindras (exempelvis låses exponeringsmekanismen), när tillåtet värde för rörelseoskärpa överskrides före exponering. Steg 2 innebär att bildöveringen stoppas (dvs. en exponerad bild kasseras direkt), när tillåtet värde för rörelseoskärpa överskrides för en exponerad bild.

Den förhindrade och eller stoppade bildöverföringen kan antingen vara absolut eller vara ett temporärt hinder i form av ett val att bilden inte uppfyller ställda krav på upplösning men ändå

kan exponeras och/eller överföras till det digitala arkivet, om användaren godkänner denna avvikelse.

Rörelseoskärpa orsakad av permanent vibration med kontant amplitud kan kompenseras genom att göra en medelvärdesbild av fler bildfält med digital bildbehandling.

Sammanfattningsvis baseras kontroll och åtgärd för rörelseoskärpa på att jämföra bildmatrisens koordinater vid två olika tidstillfällen, t.ex. före och efter bildens exponering.

För att optimera bildens kontrast bör ljuskällans styrka anpassas till bildernas individuella svärtningsgrad, vilket medför ett onödigt arbetsmoment, eftersom bildgranskningen i sig inte nödvändigtvis kräver denna ljusreglering. Beroende på användningsfrekvens kan detta bli tröttande och störa det diagnostiska arbetet.

Om denna ljusreglering skall göras med en konventionell scanner, kan det först ske efter bedömning av redan digitaliserad film, varvid hela förloppet vid behov måste upprepas på nytt.

Ljusreglering för att optimera bildens kontrast har ett mycket stort diagnostiskt värde. Uppfinningen möjligör val av s.k. dynamisk kontrastoptimering, dvs. bildens kontrastgränser utnyttjas över hela den tillgängliga gråskalan eller manuellt vald kontrastnivå.

Möjligtvis kan även kameran vara försedd med en bländare som automatiskt bländar upp/ned i beroende av filmens svärtningsgrad.

Sammanfattningsvis kan, medelst systemet enligt föreliggande uppfinning, valfria avbildningar, särskilt förstoringar med förbättrad upplösning av patologiskt intressanta delar, samt flexibla bildöverföringar till den diagnostiska enhetens digitala system för bildbehandling och arkivering utföras av

film av genomförda patientundersökningar. Genom att kombinera filmgranskning med förstoring/digitalisering/inläsning/lagring i anslutning till rondrutinen, kan patologiskt intressanta objekt valfritt förstoras för samtidig konsultation och överföring till ett digitalt bildarkiv.

Delförstoring av patologiskt intressanta områden innebär en oerhörd fördel gentemot konventionell scanning med begränsad upplösning samt väsentlig besparing av bildlagring och överföringstid jämfört med att använda en konventionell scanner med extremt hög bildupplösning. Vid överföring av hela bilden kommer då en onödigt stor bildyta att lagras med outnyttjad bildupplösning samt att disponera motsvarande mer minnesutrymme i de digitala arkiven jämfört med uppfinningen.

Överföringssystemet enligt föreliggande uppfinning är flexibelt, snabbt, noggrant och lättanvänt, vilket gör det till ett idealt system för teleradiologi över nätverk.

Föreliggande uppfinning såsom härvid beskriven löser de problem som är associerade med känd teknik. Den är självfallet inte begränsad till de ovan beskrivna och på ritningarna visade utföringsformerna, utan kan modifieras inom ramen för de bifogade patentkraven.

PATENTKRAV

1. System för överföring av medicinska filmer, särskilt röntgenfilmer, eller delar därav, för diagnostik till digital, elektronisk form och för arkivering av dessa digitala, elektroniska bilder, kännetecknat av att det innefattar en digital kamera (11) infäst i ett positioneringssystem (15), vilken kamera är ansluten till en bildskärm (25) samt till ett digitalt, elektroniskt bildarkiv för medicinsk information, varvid nämnda system är anordnat för

- selektiv positionering av den digitala kameran och granskning via bildskärmen, eller i kamerans sökare, av medicinska filmer (17) anordnade på en ljusyta för att finna patologiskt intressanta delar på filmerna,
- selektiv uppförstoring av medicinska filmer (17), eller delar därav, med funna patologiskt intressanta delar,
- selektiv exponering av medicinska filmer (17), eller delar därav, samt
- sändning av de erhållna digitala, elektroniska, medicinska bilderna till och lagring av desamma i det digitala, elektroniska bildarkivet.

2. System enligt krav 1, kännetecknat av att det är anordnat vid ett ljusskåp (21), eller annan ljusyteorgan, varvid nämnda digitala kamera (11) med positioneringssystem (15), är anordnat för selektiv positionering och för granskning via bildskärmen, eller i kamerans sökare, av medicinska filmer (17) anordnade i nämnda ljusskåp.

3. System enligt krav 1 eller 2, kännetecknat av att det innefattar en dator (23) förbunden med nämnda digitala kamera (11), nämnda bildskärm (13) samt nämnda digitala, elektroniska bildarkiv.

4. System enligt något av kraven 1-3, kännetecknat av att det, samtidigt med nämnda överföring, är anordnat för användning för diagnostik och konsultation, särskilt under en röntgenrond.

5. System enligt något av kraven 1-4, kännetecknat av att det är anslutet till ett system för digital bildarkivering och kommunikation av typen PACS (Picture Archive Communications System) på ett sådant sätt att nämnda överföring innefattar sändning av de erhållna digitala, elektroniska bilderna till, och lagring av desamma i, nämnda system för digital bildarkivering och kommunikation av typen PACS.

6. System enligt något av kraven 1-5, kännetecknat av att den digitala kameran (11) innefattar ett CCD-chips samt är försedd med ett zoomobjektiv (13).

7. System enligt något av kraven 1-6, kännetecknat av att positioneringssystemet (15) innefattar en vertikal stolpe (15a) och en koordinatvagn (15b) och den digitala kameran är anordnad att kunna förflyttas, särskilt medelst en motor, vertikalt och horisontellt.

8. System enligt något av kraven 1-7, kännetecknat av att det är anordnat att mäta förekomst av introducerad rörelseoskärpa före eller under nämnda selektiva exponering.

9. System enligt krav 8, kännetecknat av att rörelseoskärpa fastställs i beroende av att temporala intensitetsvariationer i ett enskilt bildelement detekteras.

10. System enligt krav 8, kännetecknat av att rörelseoskärpa fastställs i beroende av att temporala bildpositionsvariationer för en förutbestämd detalj på en medicinsk film detekteras.

11. System enligt något av kraven 1-10, kännetecknat av att det är anordnat att reglera ljusytans ljusintensitet i beroende av svärtningsgraden hos en enskild medicinsk film.

12. System enligt något av kraven 1-10, kännetecknat av att det innefattar en bländare framför kameran, vars bländning anordnas i beroende av svärtningsgraden hos en enskild medicinsk film.

13. System för bildarkivering och kommunikation, särskilt ett system av typen PACS (Picture Archive Communications System), kännetecknat av det innefattar åtminstone ett system (1) för överföring av medicinska filmer (17), särskilt röntgenfilmer, eller delar därav, enligt något av kraven 1-12.

14. Förfarande för överföring av medicinska filmer, särskilt röntgenfilmer, eller delar därav, för diagnostik till digital, elektronisk form och för arkivering av dessa digitala, elektroniska bilder, kännetecknat av att man medelst en digital kamera (11) infäst i ett positioneringssystem (15) eller dylikt samt en bildskärm (25), vilken digitala kamera är ansluten dels till bildskärmen, dels till ett digitalt, elektroniskt bildarkiv,

- på bildskärmen eller i kamerans sökare selektivt granskar medicinska filmer anordnade på en ljusyta för att finna patologiskt intressanta delar,
- selektivt uppförstorar medicinska filmer, eller delar därav, med funna patologiskt intressanta delar,
- selektivt exponerar medicinska filmer, eller delar därav, samt
- sänder de erhållna digitala, elektroniska, medicinska bilderna till och lagrar desamma i det digitala, elektroniska bildarkivet.

15. Förfarande enligt krav 14, kännetecknat av att medicinska filmer, vilka utgöres av röntgenfilmer, anordnas i

ett ljusskåp (21) och nämnda digitala kamera (11) med positioneringssystem (15) anordnas framför nämnda ljusskåp.

16. Förfarande enligt krav 14 eller 15, kännetecknat av att filmerna, eller delar därav, överföres av personal med diagnostisk kompetens i samband med fördiagnostik.

17. Förfarande enligt krav 14 eller 15, kännetecknat av att filmerna, eller delar därav, överföres av kliniskt kvalificerad personal i samband med diagnostisering eller konsultation, särskilt under en röntgenrond.

18. Förfarande enligt något av kraven 14-17, k ä n n e t e c k n a t a v att patientrelaterad data matas in och lagras tillsammans med de erhållna digitala, elektroniska, medicinska bilderna i det digitala, elektroniska bildarkivet.

19. Förfarande enligt krav 18, k ä n n e t e c k n a t av att det digitala, elektroniska bildarkivet utgörs av ett PACS-system (Picture Archive Communications System) och datalagringen utförs genom kommunikation med ett i PACS-systemet ingående patientinformationssystem RIS (Radiological Information System).

20. Förfarande enligt något av kraven 14-19, k ä n n e t e c k n a t a v att förekomst av introducerad rörelseoskärpa före eller under nämnda selektiva exponering mätes.

21. Förfarande enligt krav 20, k ä n n e t e c k n a t av att rörelseoskärpa fastställs i beroende av att temporala intensitetsvariationer i ett enskilt bildelement detekteras.

22. Förfarande enligt krav 20, k ä n n e t e c k n a t av att rörelseoskärpa fastställs i beroende av att temporala bildpositionsvariationer för en förutbestämd detalj på en medicinsk film detekteras.

23. Förfarande enligt något av kraven 14-22, k ä n n e t e c k n a t a v att ljusytans ljusintensitet regleras i beroende av svärtningsgraden hos en enskild medicinsk film.

24. Förfarande enligt något av kraven 14-22, k ä n n e t e c k n a t a v att bländning anordnas framför kameran i beroende av svärtningsgraden hos en enskild medicinsk film.

SAMMANDRAG

Föreliggande uppfinning avser ett system respektive ett förfarande för överföring av medicinska filmer, särskilt röntgenfilmer, eller delar därav, för diagnostik till digital, elektronisk form. Systemet innefattar en digital kamera infäst i ett positioneringssystem eller dylikt samt en bildskärm, vilken kamera är ansluten dels till den digitala kameran, dels till ett digitalt, elektroniskt bildarkiv, varvid systemet är anordnat för selektiv granskning på bildskärmen eller i kamerans sökare av medicinska filmer för att finna patologiskt intressanta delar, selektiv uppförstoring av medicinska filmer, eller delar därav, med funna patologiskt intressanta delar, selektiv exponering av medicinska bilder, eller delar därav, samt sändning av erhållna digitala, elektroniska, medicinska bilder, eller delar därav, till och lagring av desamma i det digitala, elektroniska bildarkivet.

Publiceringsfigur: fig. 1